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A BOLIDE EXPLODED OVER CENTRAL ENGLAND.

SOME of the Metropolitan newspapers on November 22nd, and many of the Provincial ones on following days, contained accounts of what nearly all of them described as an earthquake shock. Among the earliest notes which we received was the one from our excellent observer at Addington (Mr. Mathison), which will be found further on.

Our attention was immediately fixed upon the loudness of the sound, and we at once plotted on a map such records as we had obtained. These showed that at western stations, *e.g.*, in Oxford and Buckingham, the reporters spoke chiefly of noise; and at the eastern ones, Hertford and Cambridge, chiefly of earth tremor. These two facts made us suspect that, instead of an earth tremor, we had to deal with the far more exceptional phenomenon of a large meteor or bolide bursting in the atmosphere.

We, therefore, applied for a copy of each of a considerable number of local newspapers, and from them extracted a large amount of useful information. While this was in process, we heard from Mr. Fordham that he was collecting information as to the slight shock of earthquake, for the Hertfordshire Natural History Society, and in replying to him, we pointed out that after all it might have been an explosive meteor.

This turns out to have been the case, as the following interesting letter shows:—

To the Editor of the Meteorological Magazine.

SIR,—It seems most probable that the loud report, heard over so wide an area, about 8.20 a.m., on November 20th, and associated with a supposed earth tremor, was due to the explosion in the air of a large meteor.

In general, the theory of a meteoric explosion accords well with the experience of those who were in a good position for observing the effect of the concussion of the air, which was in this district so marked a feature of the supposed earthquake; but, until yesterday, I had not obtained any positive evidence suggestive of such an occur-

rence. Yesterday, however, I received a letter from Hertford, stating that a "falling star" was seen there on November 20th, at 8.20 a.m., It is described as a "brilliantly luminous body travelling across the sky from N.E. to W.," and it is stated that a portion of the meteor was seen to fall from the main body. No report was heard at Hertford. I have received no other information as to this meteor being seen; but it is possible that the foggy state of the atmosphere may have prevented its being generally observed.

As I have undertaken to collect information, with a view to drawing up a report upon the supposed earthquake, for the Herts Natural History Society, I shall be exceedingly obliged to any of your readers who may be able to help me, if they will send me any notes of observations they may have made.—Yours faithfully,

H. GEORGE FORDHAM.

Odsey Grange, Royston, December 5th, 1887.

This by no means lessens the interest of the phenomenon. We now know approximately for what we have to seek, and all the information already collected has to be examined by the light of the meteor—or rather in relation to that theory. It would be quite rash to even conjecture what must have been its size and weight; but a meteor of which the explosion was heard at Lambourn, near Swindon, Wilts, and at Newmarket, in the east of Cambridgeshire, or 84 miles from S.W. to N.E., and over a belt from N.W. to S.E. of about 30 miles—certainly over an area of 2,000 square miles—must surely have been a formidable missile. Happily, its fragments appear not to have hurt anyone; and, therefore, all that remains to be done is to be thankful for that, and to try to find some of the pieces. The morning was so foggy and misty, that it is quite possible that the observer at Hertford is the only person who saw the meteor; if he can fix the position in which he saw it explode that will be very useful. Our own impression is that it was in the neighbourhood of Thame, but we have no evidence beyond that which we append to this article. Our selection of Thame depends on (1) our high opinion of Mr. Mathison's qualities as an observer; he says, "on the horizon, about S.S.W. from where I stood;" Thame is between S. and S.S.W. from Addington: (2) the strong sense of fear indicated in the reports from Thame and its vicinity.

We have arranged the records in each county from south to north, the counties themselves are also in somewhat the same order, viz., Berks, Oxford, Bucks, Northampton, Hertford, Bedford, Essex, Huntingdon and Cambridge.

BERKS.

READING.—"L.B.," writing from Reading, says:—"At 8.18 on Sunday morning last, I heard a sound like a heavy explosion, or a big gun, very distant, followed as I fancied by a slight rumbling. I mentioned the circumstance to several persons during the day. It would be interesting to know whether anyone in Reading or the

neighbourhood had the same experience, which seems to correspond with accounts given in the *Daily News* and *Morning Post* of a slight shock of earthquake heard and felt in various counties at that same time."

MAIDENHEAD.—Loud noise heard at Bisham, 4 miles N.N.W. of here.

LAMBORNE.—This is in the extreme West of the county; we reprint *verbatim* :—

THE RECENT EARTHQUAKE.

To the Editor of the Reading Mercury.

SIR,—In the *Mercury* of last week, I notice an account of the shock of earthquake which was felt in Berkshire and other counties, on Sunday, the 20th.

I was out at my sheep-fold that morning, and I distinctly heard what I took to be the report of a large cannon. It was as if it came from the north-west. My carter also heard the sound, and he asked me if it was thunder. I thought no more of it until I saw the account in your paper. I pulled out my watch at the time; it was just 8.20 a.m.—I am, Sir, yours truly,

DAVID ALBURY.

Upper Lamborne, Swindon, Nov. 29th.

WANTAGE.—It was supposed that the Abingdon gas works had blown up; a terrific explosion was heard; doors, windows, and even slates rattled here, and also at Wootton, Marsham and Shippon, all in the vicinity of Abingdon. At Shippon, a man rushed out of doors, thinking that the house was falling.

ABINGDON.—"C. L.," writing to the *Morning Post*, says :—"The shock of earthquake described in your issue of this morning as having been felt in Cambridgeshire and adjoining counties on Sunday morning was also distinctly felt at Abingdon. I was in church at the time (8.20 a.m.), when there came a loud report as of an explosion, and all the members of the congregation, who were kneeling at the moment, looked up startled, expecting to see some catastrophe in the church, but all was quiet there. The prevailing idea then was that a dynamite explosion in or near London must have taken place."

OXFORDSHIRE.

DRAYTON, near [ABINGDON].—Very loud explosion, windows shaken.

To the Editor of the Meteorological Magazine.

SIR,—I don't know whether you have any communication from this vicinity respecting a very loud report, which I heard on Sunday morning, the 20th, at 8.20 a.m.; and which, to my judgment, seemed due to a thunder-clap, though it sounded very like a big cannon shot, or an explosion; the sound seemed to come from a S.E. direction, that quarter being full of foggy cloud at the time.

I mention it because people in this neighbourhood have connected it with certain earth shakings, which, I must say, I did not experi-

ence (I was out of doors at the time); and there is a paragraph in the *Oxford Times* this last week, headed, "A supposed earthquake shock"—in connection with the loud report alluded to.

Yours very truly,

JAMES C. ROSS.

Baldon Vicarage, Oxford, Nov. 28th, 1887.

TETSWORTH, $2\frac{1}{2}$ miles S.W. of THAME.—Loud explosion.

THAME.—At a farmhouse near here the occupants rushed out, as they thought that a chimney stack was falling. Another observer says: A very unusual sound, like the rumbling of a distant explosion.

OXFORD.—Many inhabitants were startled shortly after eight o'clock on Sunday morning by a rumbling sound like that of a distant explosion. Some persons appear not to have experienced anything unusual, but others state that doors and windows were made to rattle, and a noise was heard resembling the passing of a heavy vehicle. Reports have been received from villages in the neighbourhood to the same effect.

OXFORD.—A correspondent writes:—"I heard an extraordinary explosion in my house in North Oxford. It seemed rather to come from above than below the earth, similar to a clap of far-off thunder, or a distant sound of a moving train. I am inclined to attribute it to some atmospherical disturbance."

BICESTER.—A singular phenomenon, which appears to have been a shock of earthquake, was observed here, and in several of the surrounding villages, on Sunday morning, at about twenty minutes past eight. The effect is variously described as resembling a distant explosion and as somewhat like a clap of thunder. Happening as it did, when anticipation was being directed to what might be taking place in London, some conjectured that a terrible dynamite explosion had taken place in London, whilst an extensively prevailing report on Monday attributed the noise to an explosion, which was said to have taken place in connection with the gas works at Baron Rothschild's seat at Lodge Hill.

BUCKINGHAMSHIRE.

PRINCES RISBOROUGH.—Sunday's earthquake was distinctly felt by many persons in the town and neighbourhood. It mostly seems to have been noticed as a somewhat peculiar thunder, though one person felt the vibration as if it proceeded from the direction of Watlington along the Chiltern Hills, and in quite a contrary direction to that which would have been expected had the centre of the seismic disturbance been in Beds or Cambs as has been generally reported. In one house in the town the occupier was dressing upstairs, and the other inmates called up to ask why he was making such a noise. At Saunderton a flock of sheep was observed to be very frightened.

WENDOVER.—At Butler's Cross a cow could hardly be got to proceed further. In the main, however, people seem to feel a sort of regret that they did not notice it.

At SHABBINGTON, LONG CRENDON, TOWERSEY and CHEARSLEY, all near THAME, or between it and AYLESBURY, the explosion was loud.

BRILL.—Sound heard.

AYLESBURY.—An explosive sound, which those who heard it freely attributed to an earthquake visitation, was heard here as nearly as possible at 8.15 a.m. It was not, however, audible to all the population, many of whom at that hour on a Sunday morning are yet in their slumbers; and it was not loud enough to arouse them. Even many who were wide awake had no knowledge of it; but to those who did hear it, and especially persons who happened to be out of doors at the time, the sound was very distinctive and even startling. Most persons in Aylesbury who testify to the occurrence compare the report to that of a clap of thunder, without the customary rolling sound, and as a rule we have heard it described as apparently overhead, which seems inconsistent with the earthquake theory; the wide extent of the phenomenon and its all but simultaneousness throughout a large area is, however, puzzling. Probably the sound was much louder in some places than in others.

AYLESBURY.—The report was noticed at Long Marston, Bierton, and many other places near here.

DAGNALL.—The noise was distinctly heard in this extreme S.E. of the county; about 6 miles N.E. of TRING.

FENNY STRATFORD.—At Linslade, 4 miles S.E. from here, a rumbling noise was heard, and windows rattled.

WINSLOW.—

To the Editor of the Meteorological Magazine.

SIR,—Last Sunday morning, the 20th, when standing in the kitchen garden, shortly after eight o'clock, perhaps a quarter past, I was startled by what seemed to be the loud report of a big gun away to the south-west, and the sound reverberating along the hills in an easterly direction. The report was sharp, loud, and of short duration. I did not think it thunder, but fancied it was an explosion of some sort; being in the direction of Bicester, I thought of the gas works there. Many people about here heard the sound, and I see by the papers, the same thing was heard in many different places and wide apart, so thunder it could not be. Some fancied the sound was up in the air above head, my impression was that it was near the horizon, and about S.S.W. from where I stood; perhaps you will have received communications that will throw some light on the subject.—I am, Sir, yours obediently,

JOHN MATHISON.

Addington, Nov. 26th, 1887.

P.S.—I find that different persons have different ideas as to the direction of the sound. To me it was decidedly S.S.W., some say just the opposite quarter. It puzzles me that the sound could be heard at points so far apart as Bicester and Brackley; each is ten or twelve miles W. from here; and it was also heard at Bow Brickhill, as many miles in the opposite direction.

BUCKINGHAM.—In Buckingham the explosion—for such it is described by those who heard it—was very loud ; indeed, in many instances persons were much frightened, and the daily papers on Monday were eagerly sought, it being believed that what was heard was the report of a serious dynamite explosion in the metropolis. In the surrounding villages, too, considerable consternation was caused by the explosion. Some attribute it to thunder, and others to earthquake, whilst there are those who believe it to have been caused by meteoric influences. One person says it was a sharp distinct report as of cannon, and yet somewhat differing from the report of cannon.

NORTHAMPTONSHIRE.

BRACKLEY.—On Sunday morning a sound like the report of a cannon was heard here between 8 and 9 a.m. It appears, however, that a similar sound was heard throughout this district, at Buckingham on the one side, and also in the neighbourhood of Bicester. Various conjectures are rife as to the origin of the sound, which is attributed in some quarters to an earthquake, while others are of opinion that it was caused by an explosion. If the first account be the correct one, there appears to be no testimony as to any vibration or shock accompanying the sound.

HERTFORDSHIRE.

TRING.—The shock was distinctly felt at Aldbury, 3 miles N.E. of here. Mr. Grange's shepherd boy, who was in charge of a flock, was so startled that he bolted home, and the sheep were equally startled, though they did not resort to a stampede.

HITCHIN.—The shock was noticed at Hitchin soon after eight o'clock as the milkmen were going their rounds, and several of the men bear testimony to underground rumblings. On the high ground near Offley a sound as of low thunder was heard, accompanied by a vibration of the ground, and after an interval other distinct vibrations without any rumbling noise.

To the Editor of the Meteorological Magazine.

SIR,—I dare say you will have seen in the *Daily News* that a slight shock of earthquake was experienced here on Sunday last at 8.30 a.m. In this immediate neighbourhood it was thought that an explosion had taken place, but within a few miles I fancy the characteristics were more marked. Five miles to the S.W. the sheep and cattle seem to have been quite panic-stricken ; six miles to the N.E. the window panes rattled quite in accordance with the usual descriptions of slight earthquakes. However, can it be in any way accountable for the extraordinary depression of the barometer, which was unaccompanied by rain or wind, and which was so unusual that everybody was predicting a very deep snow ? I dare say from your different stations you will hear plenty of details.—Yours truly,
W. LUCAS.

Hitchin, Nov. 23rd, 1887.

BALDOCK.—At Baldock it was thought that the Gas Works had blown up, as windows were shaken and beds were felt to move.

ROYSTON.—About 20 minutes past eight o'clock on Sunday morning, the inhabitants in many parts of the district around Royston were startled by an unusual noise and vibration as of a violent explosion. Owing to the time at which it occurred, and its very brief duration, there was not a favourable opportunity for careful observation of its effects, but from many similar reports from villages, many miles apart, all agreeing with those of persons who noticed it in Royston, as to the time and general effect, there appears to be no way of accounting for the phenomenon, excepting on the hypothesis of its being a slight shock of earthquake. The places affected by it lie almost in a line across from Bedfordshire over the junction of the two counties of Cambs and Herts into Essex, the shock being especially felt about the Chishills and Heydon, as well as in Royston, and other places upon, or at the foot of, the chalk hills.

BEDFORDSHIRE.

DUNSTABLE.—Shortly after eight on Sunday morning, a most uncomfortable, and, to many, alarming noise, accompanied by a shaking sensation, was heard and felt by various persons in and around Dunstable. Many persons thought, at first, it must be very distant thunder, but when the rattling of doors and windows followed, together with the clinking of plates and other crockeryware standing upon shelves, this idea was at once abandoned, and it was the almost unanimous opinion that an alarming explosion had occurred somewhere in the district. However, nothing at present seems to corroborate this view. In the villages of Whipsnade, $2\frac{1}{2}$ miles S.W., and Studham, 4 miles S.W., the noise was very distinctly heard, but the shaking sensation appears to have been most felt at Whipsnade in this district.

LEIGHTON BUZZARD.—A curious sensation was felt by many persons. By some it is described as a rumbling noise, accompanied by a clattering of the window frames and loose articles in the houses. To others it seemed more like the vibration accompanying an explosion; but it is the general idea that it was not caused by thunder. By some persons it was thought to be a slight shock of earthquake.

WOBURN.—Rumbling noise heard.

AMPTHILL.—Noise heard and vibration felt, supposed to be due to a distant explosion. At Westoning, 3 miles S., Flitwick, 2 miles S., and Flitton, 2 miles S.E., the shaking was so very distinct, that almost a panic, for a time, seemed to seize several of the people, who knew not how to account for it, nor what to make of it. Its character may be correctly judged of, when it is stated that here, also, the bulk of the people inclined to the belief that what they had heard and felt was the effect of an explosion somewhere or other. The affair has caused a good deal of talk in the neighbourhood. At Silsoe, 3 miles

E.S.E., doors and windows rattled. It was also felt at Clophill, 4 miles E. At Lidlington, 3 miles W.N.W., a loud noise, apparently caused by an explosion, was heard; it was generally supposed to be due to the explosion of a boiler in the neighbourhood of Brackley. [We do not know what can have led to this place being named, it is not a large one, and is 26 miles due W. of Lidlington. —ED. *M.M.*]

STOTFOLD, 3 miles N.W. of Baldock.—The shock was distinctly felt here, and it was thought that an explosion at the Arlesey Brickfields [which are W. of Stotfold—ED. *M.M.*] had taken place.

BIGGLESWADE.—At 8.20 a.m., many persons heard a noise like a distant explosion, doors and windows were shaken; persons in fields felt earth tremor. The explosion was also heard and felt at Southill, which is 3 miles S.W., and at Warden, which is about 2 miles W.

SANDY.—The shock was heard and felt here, and also at Potton, which is 3 miles E.

BEDFORD.—The shock was felt in the villages of Cardington, 3 miles S.E., and Harrowden, 2 miles S.

RISLEY.—This is in the N. of the county, about 6 miles S.W. of Kimbolton, and is the limit towards the N.N.W. from which we have any record; the shock is said to have been felt here.

ESSEX.

SAFFRON WALDEN.—At Saffron Walden, about a quarter past eight in the morning, a rumbling noise, as of distant thunder or the discharge of artillery, was heard in the town, and also in the neighbourhood of Wenden 2 miles S.W., and Arkesden 4 miles S.W. The vibration was felt by persons in bed. The shock was also felt at Heydon, which is about 7 miles W.N.W.

HUNTINGDON.

ST. NEOTS.—The shock of earthquake on Sunday morning was felt in this neighbourhood by many persons. Mr. Clark (coachman to Mr. C. P. Rowley, of Priory Park), who was crossing the fields leading from St. Neots to Priory Hill, thought that the sound and the accompanying vibration of the earth must have been caused by a large explosion of dynamite. Some men in the employ of Mr. Isaac Hall, of Eynesbury, thought that the sound was caused by thunder, but were somewhat startled by the peculiar sensation experienced by the shaking of the earth simultaneously with the noise they had heard. The matter was freely discussed by several people a long time before it was known there had been a shock of earthquake.

CAMBRIDGE.

CAMBRIDGE.—At Gamlingay 10 miles W., a distinct shock was felt, and people were so alarmed that they rushed out of doors. Several buildings were shaken, but the wave appears to have been very partial, as in some parts of the village nothing was noticed. Many persons heard a heavy report at the time, as if a tremendous

explosion had taken place in some distant part of the country. The shock was felt in Cambridge, and also at Wimpole, 8 miles W.S.W., and at Bourne, 8 miles W.

NEWMARKET.—Shock felt here. [This is at present the most easterly and north-easterly record. — ED. *Met. Mag.*]

It is rather singular, but purely a coincidence, that the only parallel case recorded for the British Isles by the late Dr. Flight, in his *Chapter in the History of Meteorites*, occurred in very nearly the same district between 200 and 300 years since. The following is the account:—

1628, *April 9th.*, about 6 p.m.—CHALOWS AND BARKING, NEAR WANTAGE, BERKSHIRE.

Mr. Webb directs attention to a letter, preserved in Wallington's *Historical Notices*, I. 13, which was written in 1628, "by Mr. John Hoskins, dwelling at Wantage, to his son-in-law, Mr. Dawson, a gunsmith, dwelling in the Minories without Aldgate," relating to the fall of meteorites. Describing the explosion, Hoskins says: "It began as followeth:—First, as it were, one piece of ordnance went off alone. Then, after that, a little distance, two more; and then they went as thick as ever I heard a volley of shot in all my life; and after that, as if it were the sound of a drum. . . . Yet this was not all; but, as it is reported, there fell divers stones, but two is certain in our knowledge. The one fell at Chalows, half-a-mile off (from Wantage), and the other at Barking, five miles off. Your mother was at the place where one of them fell knee deep, till it came to the very rock, and when it came at the hard rock it broke, and being weighed, all the pieces together, they weighed six-and-twenty pound. The other that was taken up at the other place (Barking) weighed half a tod, 14 pound."

HOW OUR READERS CAN HELP.

We require

- (1.) Any information as to intensity or direction of the sound which any one can give us.
- (2.) Any information as to any person by whom the shooting star or meteor was seen.
- (3.) Any fragments which may have fallen. Those which fell on grass or ploughed land would probably make an approximately circular hole from 4 to 8 inches across, and from 6 to 12 inches deep.

Until we can hear of other persons who saw the meteor burst, it is impossible to say where the fragments are most likely to be found, but at present we consider the most likely locality to be near Thame, perhaps between it and Abingdon.

Intelligence can be sent either to Mr. Fordham or to us, at 62, Camden Square, N.W.

REVIEW.

Weather: a Popular Exposition of the Nature of Weather Changes from Day to Day. By the HON. RALPH ABERCROMBY, F.R.Met.Soc., &c.
London: Kegan Paul, Trench & Co., 1887. 8vo. xix. 472 pp.

THE publication of a book as one of the International Scientific Series is *per se* a compliment to the author, and an indication of its nature. The directors of a series which started with Tyndall's "Forms of Water," rapidly followed by Herbert Spencer's "Study of Sociology," "Huxley's Crayfish" and many other works of equal importance, are not likely to include any work that is not solid and good.

"Weather" possesses both these qualities—if anything it has perhaps a trifle too much of the former, but we are so delighted to get a work upon Meteorology which reverses the usual order of things—one in which we have thoughts, instead of tables—that we do not mind setting to work to master it. Of course theoretically every reviewer knows far more about the subject of the book which he reviews than does the man who wrote it. That is the ideal reviewer; we know few such geniuses, and we make no such claim.

Mr. Abercromby is, moreover, perhaps the most competent person in the world for the task he has undertaken, because he combines in an unusual degree the character of student and of traveller. Directly it occurs to him that some point can only be examined at some other part of the globe, he makes arrangements for starting, be it round the tropics to study the upper currents, or to Sweden to discuss cloud forms with Hildebrandsson, or to Tenerife to examine the distribution of atmospheric electricity. The power, and the will, to do this are not given to all, and it is not to be wondered at that he who does it, stores up experience of the greatest value.

The first part of the book deals with the simpler branches of synoptic meteorology, especially in relation to, and illustration of, old fashioned weather proverbs, and treats fully of cloud forms, but while giving full directions for observing the motion of clouds, the author says nothing of any pattern of cloud mirror. If he thinks them good, why did he ignore them; if bad, why not point out their faults?

The second and much larger part deals fully and more minutely with synoptic meteorology, cyclones, V shaped depressions, thunderstorms, tornadoes, diurnal and annual changes, and weather types. It closes with two chapters on forecasting, the first by a solitary meteorologist cut off from all communication by post or telegraph, and compelled to rely upon his own instruments and upon the appearance of the sky; the second by the head of a meteorological office surrounded by observers all communicating by telegraph—in fact, a spider in the centre of a web hundreds of miles in diameter, and along the threads of which the faintest breath of wind is

instantly transmitted to the officer on duty. No meteorologist has, however, yet been in so good a position, the telegrams may travel with lightning speed, but the lines are blocked with quotations of stocks, political speeches, racing news, love messages, &c., and therefore, even were his observers always on the watch, much delay would be inevitable, and no sooner does a heavy gale come than it breaks his web by carrying away telegraph posts.

Mr. Abercromby calls in to the aid of the central office what he terms "meteograms"—we do not remember having seen this word before, and we do not like it—we have no fondness for long words, and "meteorology" always worries us by its length—but we should have preferred one more letter in this latest addition to our vocabulary, meteorgrams: If all is to be sacrificed to brevity, why not cut it down to metgrams. This, however, is a digression, the fact which we were going to point out is, that our imaginary spider can seldom if ever utilize these meteograms—(1) because central offices are usually in the heart of cities, where accurate observations can rarely be made; (2) because "meteograms," such as the author reproduces on p. 152, cannot be obtained until at least one or two days after the storm is over. An instrument could be designed which would do it. Van Rysselberg's is very near it, but in this country, at any rate, the money all goes in harmonic analysers, and apparatus to give mean values true to hundredths of a Fahrenheit degree, instead of in efforts to improve our storm warnings.

We have noticed very few errors. Buy Ballot, Gulberg and Hildebrandson appear too frequently for the printer to be held wholly responsible, and it is the first time that we have heard of Stonyhurst, *near Manchester*, but these are evidently trifles. Of errors or misstatements as to facts we have not seen one, and the very numerous charts and diagrams are good—we cannot, however, say so much for the tornado-cloud on p. 269—we doubt if it is admired by either author, engraver or publisher.

Talking of tornadoes, we regret that Mr. Abercromby has not referred to the disruptive force generated within buildings by the low pressure centre passing over them. Of true tornadoes in foreign countries we have no personal experience, but in this country more damage is often done by the sudden expansion of confined air than by the motion of translation of the whole meteor.

In the Preface the author says that "it has not been considered necessary to give references to all the original authorities in a popular work." We agree with that, but if this be a popular book it is certainly a high level popular one—one requiring careful thought in order to transfer all the writer's ideas to the reader's mind—and it is one that no weather student can be without; that being so, we think that a dozen or two of additional references would have been useful, *e.g.*, from p. 237, a reference to Mr. Abercromby's own paper in the *Quar. Jour. Met. Soc.*, Vol. ii., p. 450.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, MAY, 1887.

STATIONS. (Those in italics are South of the Equator.)	Absolute.				Average.				Absolute.		Total Rain.		Aver. Cloud.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days	
	Temp.	Date.	Temp.	Date.									
England, London	71·2	8	32·8	1	59·8	43·4	43·3	79	118·8	24·9	1·45	21	7·2
Malta.....	91·9	31	52·0	12	75·7	59·4	55·9	69	144·6	46·2	·17	4	3·0
Cape of Good Hope ...	88·9	16	34·9	28	71·0	49·2	...	87	...	...	4·01	9	5·9
Mauritius.....	79·0	1a	62·6	8	77·0	66·9	64·8	80	130·4	52·3	4·68	15	5·3
Calcutta.....	98·9	18	65·0	3	92·7	77·6	76·0	69	158·5	63·9	5·17	11	5·0
Bombay.....	91·4	8	77·8	7	90·0	80·7	74·5	71	149·0	74·0	·09	4	3·9
Ceylon, Colombo	89·0	10	73·3	24	86·6	77·5	72·1	76	145·0	69·5	14·14	21	7·5
Melbourne.....	66·0	1	36·8	20	58·3	47·0	47·6	84	120·0	29·9	1·98	15	7·9
Adelaide.....	67·9	3	40·4	19	62·2	49·7	48·2	75	129·0	33·4	4·09	22	7·1
Wellington .....	...	...	...	...	...	...	...	...	...	...	...	...	...
Auckland	71·5	2	42·5	30	63·0	51·5	50·0	77	127·0	31·0	5·30	22	6·8
Falkland Isles.....	...	...	30·7	4	...	35·9	38·9	91	98·3	25·2	2·18	21	7·0
Jamaica, Kingston.....	90·5	31	66·5	4	88·2	71·1	70·7	72	...	...	4·33	...	...
Barbados	84·0	21b	68·0	1	82·0	72·0	70·7	78	146·0	...	5·75	19	7·0
Toronto	78·3	20	39·2	14	68·8	47·8	47·8	68	...	32·8	·81	9	5·5
New Brunswick, Fredericton	84·7	10	33·0	2	64·4	40·6	41·6	62	...	...	1·65	10	5·7
Manitoba, Winnipeg ...	90·6	11	29·0	16	68·7	42·3	45·0	65	...	...	3·01	13	5·4
British Columbia, Victoria	80·0	29	30·0	12	62·4	41·4	...	...	...	...	1·32	10	...

a And 17, 20. b And 22.

REMARKS, MAY, 1887.

MALTA.—Mean temp. 66°·2. Sea temp. ranged from 62°·5 to 72° 6 J. SCOL. S.

Mauritius.—Mean temp. of air 1°·3, of dew point 0°·6, and rainfall ·18 in. below average; mean pressure 30·085 in., slightly above average; mean hourly velocity of wind 7·2 miles, 3·2 miles below average; extremes 23·7 miles on 23rd, and 1·6 miles on 2nd and 3rd; prevailing direction E.S.E. T and L on 1st and 17th, and T on 2nd.

C. MELDRUM, F.R.S.

Melbourne.—Mean temp. of air 0°·7, and rainfall ·10 in. below average; mean temp. of dew point 1°·6, humidity 6, amount of cloud 1·4, and pressure ·075 in. above average. Prevailing winds N. and W.; strong on six days. Hoar frost on 20th. Dense fog on five days; heavy dew on five days.

R. L. J. ELLERY, F.R.S.

Adelaide.—Mean pressure 30·195 in., ·068 in. above the average of 30 years. Mean temp. 1·5 below average. Rainfall an inch above average.

C. TODD.

AUCKLAND.—A wet and disagreeable month, with unusually low pressure. Mean temp. close to the average. Rainfall 1·30 in. above the average.

T. F. CHEESEMAN.

KINGSTON.—Rainfall ·49 in. below average. On the 2nd, a H storm occurred in Kingston about 1 p.m., the stones varying from the size of a pea to that of a pigeon's egg. The max. temperature of the day (88°·1) occurred a little before the storm, which reduced the temperature to 71°.

MAXWELL HALL.

BARBADOS.—Pressure steady. Mean temp. 76°, same as 30 years' average. Rainfall above average. Mean hourly velocity of wind 10·3 miles, same as 14 years' average. L on 21st. TS on 22nd. Three days were overcast.

R. BOWIE WALCOTT.

SUPPLEMENTARY TABLE OF RAINFALL,
NOVEMBER, 1887.

[For the Counties, Latitudes, and Longitudes of most of these Stations,
see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
II.	Dorking, Abinger	5·89	XI.	Castle Malgwyn	3·59
„	Margate, Birchington...	4·21	„	Rhayader, Nantgwillt..	4·85
„	Littlehampton	4·77	„	Carno, Tybrith	3·68
„	Hailsham	5·31	„	Corwen, Rhug	2·46
„	Ryde, Thornbrough	3·94	„	Port Madoc	4·07
„	Alton, Ashdell	5·06	„	I. of Man, Douglas	3·94
III.	Oxford, Magdalen Col..	1·85	XII.	Stoneykirk, Ardwell Ho.	1·78
„	Banbury, Bloxham	2·39	„	New Galloway, Glenlee	4·91
„	Northampton	1·85	„	Melrose, Abbey Gate...	3·64
„	Cambridge, Beech Ho...	1·83	XIII.	N. Esk Res. [Penicuik]	5·75
„	Wisbech, Bank House..	1·65	XIV.	Ballantrae, Glendrisaig	3·14
IV.	Southend	3·00	„	Glasgow, Queen's Park.	2·55
„	Harlow, Sheering	3·36	XV.	Islay, Gruinart School..	2·86
„	Rendlesham Hall	3·78	XVI.	St. Andrews, Pilmour Cot	2·97
„	Diss	2·07	„	Balquhider, Stronvar..	6·57
„	Swaffham	2·34	„	Dunkeld, Inver Braan..	2·42
V.	Salisbury, Alderbury ...	3·66	„	Dalnaspidal H.R.S. ...	5·79
„	Warminster	3·93	XVII.	Keith H.R.S.	3·01
„	Ashburton, Holne Vic..	6·54	„	Forres H.R.S.	2·50
„	Holsworthy, Clawton...	...	XVIII.	Strome Ferry H.R.S....	3·58
„	Hatherleigh, Winsford.	...	„	Tain, Springfield .....	...
„	Lynmouth, Glenthorne.	6·09	„	Loch Shiel, Glenaladale	8·63
„	Probus, Lamellon	4·59	„	S. Uist, Ardkenneith ...	...
„	Wincanton, Stowell Rec.	3·19	„	Invergarry	5·24
„	Taunton, Lydeard Ho ...	3·76	XIX.	Lairg H.R.S.	2·14
„	Wells, Westbury	3·11	„	Forsinard H.R.S.	3·61
VI.	Bristol, Clifton	2·77	„	Watten H.R.S.	1·98
„	Ross	3·00	XX.	Dunmanway, Coolkelure	4·48
„	Wem, Clive Vicarage ...	1·38	„	Fermoy, Gas Works ...	2·35
„	Cheadle, The Heath Ho.	1·33	„	Tipperary, Henry Street	2·25
„	Worcester, Diglis Lock	2·45	„	Newcastle West .....	...
„	Coventry, Coundon	1·82	„	Miltown Malbay	3·59
VII.	Melton, Coston	1·77	XXI.	Gorey, Courtown House	3·80
„	Ketton Hall [Stamford]	2·26	„	Navan, Balrath	3·97
„	Horncastle, Bucknall ...	1·83	„	Mullingar, Belvedere...	3·91
„	Mansfield, St. John's St.	2·39	„	Athlone, Twyford	3·09
VIII.	Macclesfield, The Park.	...	„	Longford, Currygrane...	3·30
„	Walton-on-the-Hill	1·67	XXII.	Galway, Queen's Coll...	4·54
„	Lancaster, South Road.	2·11	„	Clifden, Kylemore	6·22
„	Broughton-in-Furness ..	3·30	„	Crossmolina, Enniscoe..	5·37
IX.	Wakefield, Stanley Vic.	1·33	„	Collooney, Markree Obs.	4·34
„	Ripon, Mickley	2·70	XXIII.	Rockcorry	2·41
„	Scarborough, West Bank	2·63	„	Warrenpoint	2·80
„	East Layton [Darlington]	3·67	„	Newtownards .....	...
„	Middleton, Mickleton ..	3·75	„	Belfast, New Barnsley..	3·02
X.	Haltwhistle, Unthank..	3·89	„	Cushendun	2·77
„	Shap, Copy Hill	3·78	„	Bushmills	3·24
XI.	Llanfrechfa Grange	4·21	„	Stewartstown	2·45
„	Llandovery	4·95	„	Buncrana	4·35

NOVEMBER, 1887.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.						TEMPERATURE.				No. of Night below 32°.
		Total Fall.	Difference from average 1870-9	Greatest Fall in 24 hours.		Days on which .01 or more fell.	Max.		Min.			
				Dpth	Date.		Deg.	Date	Deg.	Date.		
I.	London (Camden Square) ...	inches 3.40	inches. + .96	in. .60	3	18	55.4	4	22.1	17	8	14
II.	Maidstone (Hunton Court)...	4.73	+ 1.83	.87	2	18	...	...	...	...	...	...
III.	Strathfield Turgiss	3.78	+ 1.03	.64	19	19	55.1	4	18.8	16	12	20
IV.	Hitchin	2.94	+ .33	.55	3	16	52.0	3	21.0	16	13	...
V.	Winslow (Addington)	2.51	+ .01	.73	9	21	54.0	4,6	16.0	17	12	19
VI.	Bury St. Edmunds (Culford) ..	2.38	— .45	.40	2	17	52.0	4,5	19.0	16	10	...
VII.	Norwich (Cossey)	2.31	— 1.00	.32	9	17	...	...	...	...	...	...
VIII.	Weymouth (Langton Herring) ..	3.72	...	.62	18	22	53.0	2,4b	26.0	16	6	...
IX.	Barnstaple	3.56	— .59	.90	3	14	55.0	7	...	...	...	...
X.	Bodmin	4.68	— .64	1.23	21	24	51.0	26	27.0	16	3	10
XI.	Stroud (Upfield)	2.88	— .06	.52	5	15	55.0	1	23.0	15d	12	...
XII.	Church Stretton (Woolstaston) ..	2.82	— .62	.49	1	18	52.5	2	24.0	18	11	16
XIII.	Tenbury (Orleton)	2.61	— .25	.47	3	18	54.0	2,5	16.0	17	13	18
XIV.	Leicester	1.73	...	.32	5	20	55.8	6	22.5	16	9	19
XV.	Boston	1.52	— .85	.30	5	13	58.0	6	23.0	16j	10	...
XVI.	Hesley Hall [Tickhill]	1.55	...	.29	3	17	55.0	6	23.0	16e	10	...
XVII.	Manchester (Ardwick)	1.10	— 1.87	.20	2,5	11	53.0	4	25.0	16f	10	...
XVIII.	Wetherby (Ribston Hall) ...	1.78	— .98	.38	6	12	...	...	...	...	...	...
XIX.	Skipton (Arncliffe)	4.58	— 1.17	.65	5	19	52.0	6	23.0	23	13	...
XX.	Hull (Beverley Road) .....	...	...	...	...	...	...	...	...	...	...	...
XXI.	North Shields	2.57	— .88	.45	14	21	55.0	26	24.5	16	9	11
XXII.	Borrowdale (Seathwaite)	8.62	— 3.20	2.85	26	18	...	...	...	...	...	...
XXIII.	Cardiff (Ely)	3.89	— .31	.82	3	16	...	...	...	...	...	...
XXIV.	Haverfordwest	4.88	— .46	.74	2	18	52.5	1,2	22.0	15g	11	16
XXV.	Plinlimmon (Cwmsymlog) ...	3.52	...	.57	5	11	...	...	...	...	...	...
XXVI.	Llandudno	2.28	— 1.63	.36	2	16	53.5	26	29.0	24	...	...
XXVII.	Cargen [Dumfries]	3.81	— .10	.89	1	14	51.2	8	21.0	24	13	...
XXVIII.	Jedburgh (Sunnyside)	2.91	— .10	.61	7	18	56.0	26	17.0	16	9	...
XXIX.	Old Cumnock	3.94	+ .47	.97	27	15	50.0	5,26	20.0	14	...	...
XXX.	Lochgilhead (Kilmory)	4.34	— 1.02	1.63	25	16	...	...	...	...	...	...
XXXI.	Oban (Craigvarren)	4.81	...	1.15	25	17	52.3	9,26	27.2	15	7	...
XXXII.	Mull (Quinish)	5.00	...	.76	25	18	...	...	...	...	...	...
XXXIII.	Loch Leven Sluices	4.60	+ 1.05	1.00	7,8	14	...	...	...	...	...	...
XXXIV.	Arbroath	2.55	— .60	1.04	6	9	51.0	1	28.0	15	7	...
XXXV.	Braemar	5.29	+ 1.52	1.80	1	20	50.6	26	19.0	15	17	23
XXXVI.	Aberdeen	2.54	...	.60	7	22	55.0	26	27.0	15	9	...
XXXVII.	Lochbroom	4.42	...	1.19	25	18	...	...	...	...	...	...
XXXVIII.	Culloden	1.83	— .87	...	...	...	50.0	3,25	22.0	15	5	23
XXXIX.	Dunrobin	1.67	...	.37	25	12	57.8	16	28.8	29	11	...
XL.	Kirkwall (Swanbister) .....	...	...	...	...	...	...	...	...	...	...	...
XLI.	Cork (Blackrock)	2.52	— 2.09	.54	21	17	53.0	1,2	22.0	15	10	...
XLII.	Dromore Castle	3.62	...	.44	3	18	56.0	26	22.0	11	...	...
XLIII.	Waterford (Brook Lodge) ...	2.79	...	.55	5	17	53.0	1,4	23.0	16	9	...
XLIV.	O'Briensbridge (Ross)	2.82	...	.51	5	18	51.0	5,30	24.0	24	10	...
XLV.	Carlow (Browne's Hill)	3.20	+ .28	.45	5a	20	...	...	...	...	...	...
XLVI.	Dublin (Fitz William Square) ..	3.01	+ .73	.87	5	18	55.4	26	28.0	24	4	16
XLVII.	Ballinasloe	3.12	+ .12	.75	5	21	48.0	26	20.0	16h	12	...
XLVIII.	Waringstown	2.25	— .46	.40	2	19	55.0	5	24.0	19	13	20
XLIX.	Londonderry (Creggan Res.) ..	3.01	...	.72	6	18	...	...	...	...	...	...
L.	Omagh (Edenfel)	2.78	— .27	.90	1	15	50.0	4,5c	25.0	15i	12	20

a And 20. b And 5, 6. c And 8, 9, 26. d And 16. e And 18. f And 17. g And 16, 23.

h And 24. i And 19, 23. j And 17, 18.

+ Shows that the fall was above the average; — that it was below it.

METEOROLOGICAL NOTES ON NOVEMBER, 1887.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail, S for Snow.

ENGLAND.

STRATHFIELD TURGISS.—The month opened with a change to higher temperature which brought gales and showery weather over this district. The close of the month was remarkable only for its wintry character, its dense fogs, severe frosts and heavy rainfall. Fine lunar rainbow at 8.15 p.m. on 3rd.

ADDINGTON.—The early part of the month was wet. No frost to speak of occurred until the 16th, when there was a great fall of temperature, the min. of that day being 19°, the 9 a.m. temp. 22°, and the max. 27°. On the 17th, the shade min. was 16°, the 9 a.m. temp. 20°, and the grass min. 13°. I have no other record of so low a temperature so early in the month. On both days the trees were a beautiful sight. Dense fog on 20th and 21st. High wind on 26th and 27th.

CULFORD.—A cold, stormy month, with frequent frosts and fogs.

LANGTON HERRING.—The month began with very stormy weather and low pressure; the first ten days were showery; cold weather then prevailed till the 24th, the max. temp. being below 44° on 12 consecutive days. From the 9th to the 24th inclusive, the wind at 9 a.m. was N.E. The storms of the first three days were accompanied by T and L. The mean. temp. at 9 a.m. was 3°·2 below the average; the month being the coldest November for 16 years, with the exception of 1878 and 1879. Rainfall slightly above the average, but the deficit from the beginning of the year was 8.67 in. at the close of the month. Fog and solar halo on 21st.

BODMIN.—The finest November recorded, with, happily, no fogs. Nine brilliant days and five very fine. Mean temp. 40°·7.

WOOLSTASTON.—A cold month; mean temp. 38°·5. A sea eagle was seen on one of the Shropshire hills on the 1st.

ORLETON.—The temperature of the first 14 days was rather above the average, with R every day till the 12th. From 14th to 24th, the weather was very cold, with severe frosts. The last week was variable, with slight falls of R, and a few frosts. Up to the close, the R had not caused the drains to flow. Pressure was subject to much fluctuation; very low on 3rd. Mean temp. 3° below the average. No S fell.

LEICESTER.—A very changeable month, with some sharp frosts and some bright sunshine, dense fogs and bright clear days.

MANCHESTER.—On the whole a fine month; very mild in the earlier part, cold about the middle, and mild again towards the end. Rainfall small.

WALES.

HAVERFORDWEST.—A great storm occurred on the 1st, doing much damage to roofs and trees; pressure 28.811 in., corrected; T, L and large H at intervals on the 2nd, and very stormy on 3rd, with violent squalls and heavy showers of R and H. Pressure was below 29 inches for more than 48 hours. A cold and very frosty period occurred from 11th to 19th. The month ended wet and unusually mild. Mean temp. considerably below the average.

LLANDUDNO.—Stormy and wet at the commencement. T and H on 4th. S on distant mountains on 20th. S.W. gale of considerable strength on 26th. H on 27th.

SCOTLAND.

CARGEN.—The mean temp. (39°·5) was 2° below the average. The sky was unusually overcast, the duration of sunshine being only 55 hours, the average for the month being 88 hours. The R during the month had little or no effect on the deep wells and springs in the district. The total rainfall for the 11 months was 26.30 in., 13.62 in. below the average. The driest year previously was 1880, with a fall of 28.19 in. for the 11 months. Severe TS on 1st.

JEDBURGH.—The weather on the whole was seasonable, though it was rather stormy at the beginning and at the end of the month. Three inches of S fell on the morning of the 15th.

OBAN.—The early part of the month was very fair with a prevalence of S.E. winds, and with frosts until the 20th. On the 21st there was a very fine aurora, and on the 24th the weather changed, and the month closed with the usual gales and heavy R. The mean pressure was low. H and T on 24th.

BRAEMAR.—A month of very changeable weather.

ABERDEEN.—The weather of the month was open and seasonable; rainfall about half-an-inch below the average. S showers on 14th.

LOCHBROOM.—The first half of the month was very fine, on the whole; the latter half was a mixture of varied weather. Frost prevailed to a greater degree than usual. On the 25th a storm of wind and R occurred, and thence to the end real winter weather prevailed. S and sleet on 20th, 21st and 22nd. R, H and S on 24th.

CULLODEN.—A favourable month for outdoor work, dry periods occurring from 8th to 13th, and from 15th to 21st. At the close of the month there was much wind, with heavy showers at intervals.

IRELAND.

BLACKROCK.—Cold, with breezy showers during the first week, then the proverbial November weather to the end. The thirteenth month in succession with rainfall below the average. Mean temp. ($40^{\circ}5$) 2° below the average of 11 years.

DROMORE.—On the whole very fine, with a little frost now and again, but only of short duration.

O'BRIENSBRIDGE.—Fine open weather for the season, quite in keeping with the remarkable weather of the preceding ten months, the rainfall of the eleven months being barely half the average. Some strong winds from S.W. occurred in the early part of the month.

DUBLIN.—November differed from all the previous months of 1887, in having a rainfall decidedly above the average; due to a fall of $\cdot87$ in. on the 5th. The month was cold and very unsettled, damp and dull. Fog was very prevalent in the third week. Pressure was extremely low at the commencement and remained unsteady throughout. Temperature also varied remarkably and quickly, the highest and lowest readings being recorded within some 48 hours. The prevailing winds were westerly (S.W. to N.W.), but in the second week a warm easterly breeze was experienced. The mean temp. ($42^{\circ}6$) was, as in September and October, decidedly below the average ($44^{\circ}4$). In the preceding 22 years, November was coldest in 1878 ($38^{\circ}2$), and in 1870 ($42^{\circ}2$). High winds on 10 days, gales on three days. Fog on nine occasions. H on four days. Shade temp. exceeded 50° on seven days. Mean humidity 88; mean amount of cloud $6\cdot3$.

EDENFEL.—The first and last weeks were rather wet and unsettled, the intervening fortnight was remarkably fine. Rainfall and temperature were both below the average.

ERRATUM, *Met. Mag.*, No. CCLXI., October, 1887.

An absurd, but very obvious error, occurs in our article on the Climate of the British Empire during 1886, in the October number of the current volume. On p. 128, lines 12 and 13, below *zero* should in each case be below *freezing-point*.